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Utilization of Mango Kernel Starch as an Edible Coating of Raw Pork

Vipin Bahal [1] and Anshika Bhardwaj[2]

[1] M.tech. Student, Department of Food Science and Engineering, Kurukshetra University, India

[2] Assistant Professor, Department of Food Science and Engineering, Kurukshetra University, India

Abstract

The effect of edible coating (mango kernel starch) on the physicochemical properties of raw pork Stored for 12 days under refrigerated temperature was investigated. Mango kernel is composed of 6.39% of starch by fresh weight basis and 45.64% of starch by dry basis. The results indicate that the average moisture content of mango starch is around (4.93±0.1%), ash content (0.12±0.02%), amylose content (35.06%). Edible coating was prepared using mango starch and raw pork chunks were treated with different concentrations of starch water, 5% starch, 5%+1% ascorbic acid, 5% starch +0.1% moringa extract, 5% starch +0.2% moringa extract as a edible coating and packed in LDPE pouch. Mango kernel starch had a significant ($p<0.05$) effect on TBARS and color parameters and texture as compared to control but had non-significant effect on water holding capacity, cooking loss of packaged pork.

Keywords- *Pork; Mango; Starch; Meat*

1. Introduction

Meat is a perishable food so prolonging its shelf life is an important objective for producer. The loss of meat freshness after slaughtering results mainly from the activity of endogenous and exogenous enzyme, the oxidation of lipids and pigments and bacterial putrefaction. There are many factors influencing meat shelf life such as pH, water content and availability of oxygen that could promote spoilage bacterial growth and oxidative processes during storage (Gadallah and Fattah, 2011). Refrigeration storage is usually the most common preservation method of fresh meat and meat products. In order to extend refrigerated storage time, antimicrobial and antioxidant additives especially of synthetic origin, are added to meat products. However, consumers increasingly demand use of natural products as alternative preservatives in foods. The use of antimicrobial compounds is important not only in the preservation of food but also safe for human consumption. Bacterial and fungal infections pose a greater threat to health, most notably in immune compromised subjects, hence the need to find natural, cheap and effective antimicrobial agents (Gadallah and Fattah, 2011). Meat is composed of fat, water, protein, fibers, carbohydrate, minerals, vitamins, and other bioactive components. There are the following examples of edible organs such as liver, spleen, and kidney. Meat cuts are usually composed of various skeletal muscles which contain various types of fibers of different metabolic type.

Pork are consumed all over the world for the taste and nutritive value that accounts for the increasing demand. Both manufacturer and consumer are concerned with the safety of meat and hence quality control protocols are required during processing and preservation. The factors which include meat palatability are tenderness, juiciness, flavor, aroma, color, texture, appearance. Among which tenderness is generally considered the most important palatability factor by the consumers. The meat industry has made great progress in improving tenderness through both genetics improvement and meat science technology.

The characteristics of raw meats are influenced greatly by a variety of factors like animal (breed, sex, age), environmental (feeding, transporting and slaughtering condition), and processing (storing time/temperature condition). During the aging, pork muscles undergo several changes that can affect their quality. These changes are reflected in many characteristics such as color, tenderness, flavor, and juiciness. One of the greatest challenges in the meat industry is to obtain reliable information about meat quality during post-mortem along the production process, ultimately providing guaranteed quality of pork products for the consumers (Liu et al., 2003).

This paper enables extraction of starch from mango kernel and involving it as a coating material for fresh pork to improve its quality and extend the shelf life.

Remaining paper is summarized as follows. Section II illustrates the related work from literature. Section III presents the proposed work on enhancement in shelf-life of pork. Section IV provides the computational results. Finally, Section V described the concluding observations.

2. Related Work

Now a day's there is a growing interest in edible coatings due to many factors such as environmental concerns, new storage techniques and markets development for underutilized agricultural commodities. An edible coating or film could be defined as primary packaging made from edible components. In this process thin layer of edible material can be directly coated to a food or formed into a film and be used as a food wrap without changing the original ingredients or the processing methods. Edible film and coatings have been used to improve the gas and moisture barriers mechanical properties, sensory perceptions, convenience, and microbial protection of various food products. Edible coating are also defined as thin layers of edible materials, are usually applied as a liquid of varying viscosity to the surface of food product by spraying, dipping, brushing or other methods. Polysaccharides, proteins, and lipids are the main polymeric ingredients used to produce edible coating (Hernandez-Izquierdo and Krochta, 2008). Polysaccharide based edible films are hydrophilic and provide strong hydrogen bonding that can be used to bind with functional additives such as flavors, color, and micronutrients. Some new edible coatings have been obtained from mucilage's, which are heteropolysaccharides obtained from plants (Kamel, 2014).

Mango (*Mangifera indica)* is a very common tropical fruit usually found in south Asia, especially in eastern India, china, Burma, Andaman Islands and Central America. Mango belongs to the genus *Mangifera*, consisting of numerous species of tropical fruiting trees in the flowering plant family Anacardiaceae. It is cultivated and grown vastly in many tropical regions and widely distributed in the world. The mango is the indigenous to the Indian subcontinent and south Asia. It is one of the most extensively exploited fruits for food, juice, flavor, fragrance and color and a common ingredient in new functional foods often called super fruits (Kittiphoom, 2012).

Traditionally, mango has been in many medicinal applications like many phenolic compounds which contain in the mango peels, mango bark, mango puree, concentrate, mango leaves, mango pulps and seed kernels (Joona et al., 2013). Mango flesh are usually consumed or processed in an industry thus disposing a large amount of seed as solid waste. Approximately 40-60% waste is generated during processing of mango, out of which peel and kernel constitute 12-15% and 15-20%, respectively. Mango kernel contains a significant amount of starch and can be utilized for starch extraction.

Antioxidants used in meat industry are natural and synthetic antioxidant such as garlic, green tea, rosemary, thyme, ascorbic acid and BHT, BHA respectively. Due to concerns about toxicological safety of synthetic antioxidants such as butylated hydroxytoluene (BHT) and butylated hydroxyanisole (BHA), it may be desirable to replace theses conventional antioxidants with natural antioxidative substances.

3. Proposed Work

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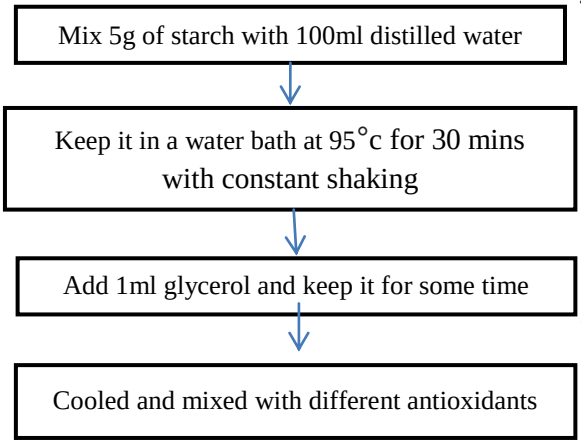

Fig.1: Preparation of mango kernel starch coating

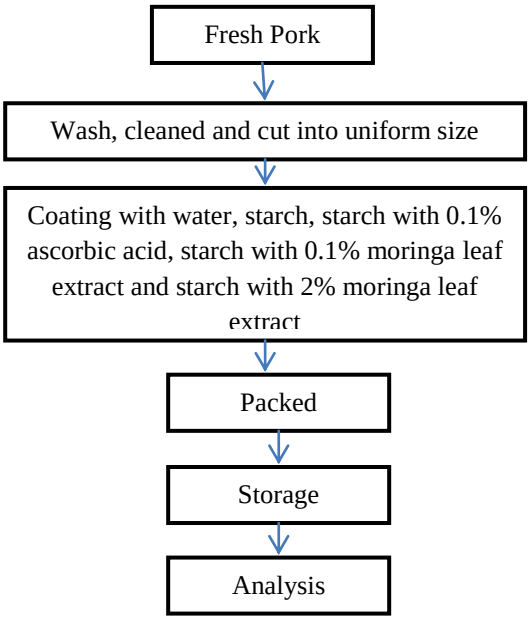

Fig.2: Preparation of sample treated with mango kernel starch coating

4. Results and Discussion

1. Mango starch has a slightly lower pH of 5.27± 0.03.
2. A moisture content was 4.93 ± 0.1%. The relatively low moisture content of the starch makes them easy to store at room temperature.
3. Ash content was found to be 0.12±0.02% in starch. The low ash content is an indication of the good quality of a starch. If the ash content is higher than the micro-organism grow.
4. The amylose content for mango starch was observed 35.06% which is very high. The emulsion capacity and foaming capacity of mango starch is also high i.e. 52.33% and 3.93%, respectively. There is no direct correlation between swelling and solubility which is observed. The mango starch with its high swelling power is due to their high amylose content.
5. The water binding capacity is affected by the presence of mineral like phosphorous in starch. The mango starch has fairly good water binding capacity. Since, the amount of water taken up by starch is very important in food application. The mango starch has moderate foaming capacity.
6. Mango starch has moderate paste clarity at all pH values. Mango starch shows lower light content; this may be due to high amylose content.
7. When the starch granules are heated above the gelatinization temperature in the presence of water. The granules observe a large amount of water and swell, resulting in high viscosity. Thus the mango starch shows increment in viscosity with the increase in a temperature.
8. The turbidity value of starch suspensions from all the seeds increases progressively during storage. The changes in turbidity during storage have been attributed to the interaction between leached amylose and amylopectin chains that leads to development of function zones.
9. Moisture content of mango starch also exhibited significance effect on texture of mango starch. Decrease in moisture content then increase in hardness and springiness value of starch gel. Water is known to act as a plasticizer in food systems; therefore, its effect on starch texture was anticipated.

5. Conclusion

The study showed that mango kernel is a good source of starch and can be utilized as a raw material for edible coatings. The results of this study showed that edible coating prepared from mango kernel starch improved the physicochemical quality of raw pork. The properties such as significant increase in WHC, moisture and cook loss and increase in drip loss, shear force, color values. The samples coated with starch and ascorbic acid showed the best quality

parameters. From the study it is shown that mango kernel starch can be used to protect meat product against oxidative rancidity without any adverse effect on other quality attributes. The wastage of mango kernel can be overcome by producing starch from mango kernel.

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